To teach or not to teach, that’s the question - robotic programming for smaller series

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Decreasing the programming complexity of robots is essential in robot adoption, especially for high-mix low-volume production. While teach by demonstration has been the benchmark for many years, OLRP keeps gaining popularity thanks to its versatility and user-friendliness, and recent evolutions, such as a wider commercial offering and the availability of brand-independent solutions.

“Fully 40 percent of a robot’s ongoing costs lie in its programming,” said Jason Barton, chief commercial officer for Boston-based Realtime Robotics Inc. It is easy to understand why decreasing the programming complexity of robots is a key element in robot adoption - especially when looking at SMEs that run high-mix low-volume production and need affordable and flexible solutions that are easy to deploy and re-program.

Teach by demonstration versus offline robot programming

There are two main ways of programming, teach by demonstration and offline robot programming:

- Teach by demonstration is when the robot is moved by means of a pendant, joystick or hand-guiding device to the desired location. The program is built online, point by point (Figure 1).
- Offline Robot Programming (OLRP) is when the program is prepared offline with the aid of an external software. Afterward the program is loaded and checked on the robot.

While teach by demonstration has been the benchmark for many years and it is preferable for simple programs, OLRP keeps gaining popularity due to its versatility and user-friendliness, especially when complex programs are involved. The table below presents the main pros and cons of the two different methods.



Figure 1: KUKA hand guiding at Sirris facility (left); KUKA pendant interface and example of program (right)

Programmeermethode	Voordelen	Nadelen
Teach-by-demonstration	Geschikt voor eenvoudige bewegingen. De meeste operatoren zijn met dit concept vertrouwd. Intuïtief.	Hoge uitvaltijd van de robot. Wordt onbetaalbaar wanneer aan veel punten moet worden gedacht. De programmering is merkafhankelijk. Groter risico op fouten en botsingen.
OLRP	Eenvoudig aan te leren software, vooral voor programmeurs die vertrouwd zijn met CAD/CAM-omgevingen. Verlaagt de uitvaltijd van de machine. Een must wanneer het programma talrijke punten behelst. Ideaal voor haalbaarheidsstudies en het inschatten van cyclustijden. Vermindert de risico's door fouten en botsingen automatisch te detecteren en te vermijden. Valideert het robotproces door simulatie. Een enkel platform voor verschillende robotmerken.	De totale programmeertijd kan langer zijn, ook al is de uitvaltijd van de robot lager. Virtuele modellen zijn nooit 100% nauwkeurig. De programma's moeten nog worden gefinetuned en online gecontroleerd.

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Teach by demonstration versus OLRP: pros and cons

By using OLRP, not a single line of code needs to be written, since the user will be working in a CAD/CAM-like environment.

Furthermore, OLRP companies such as RoboDK and Octopuz offer a variety of free tutorials on YouTube, which makes self-teaching possible.

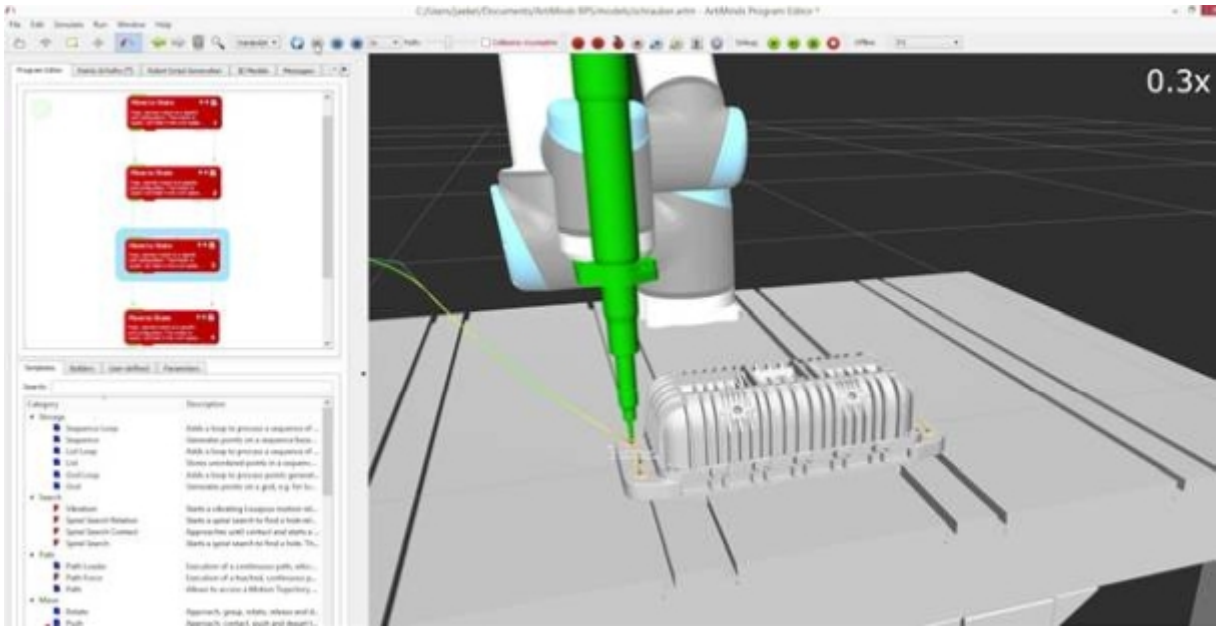
Learning the basics of the software and producing a first robotic simulation can be done in a matter of hours (Figure 2).

OLRP software: commercial offering is ever expanding

OLRP software is definitely helping on the subject of making robots more accessible.

While 10 years ago, most OLRPs software were tied to a specific robot brand, nowadays, several brand-independent solutions are available, allowing more freedom in the robot selection for a new applications.

Some of these OLRPs have an intuitive drag and drop interface, such as Artiminds (Figure 3), Drag & Bot and Roxi, that simplify the software learning process and are particularly suited for programming activities, such as pick and place, where limited numbers of points are involved.



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Figure 3: Artiminds and its drag and drop interface

Other software, such as RoboDK and Octopuz (Figure 4), have a fully developed UI interface (CAD/CAM alike), where your own robotic cell can be reproduced by importing 3D models. It is easy to build fully functional simulations to validate your process, post-process it to your robot's native language and run it live after few tweaks.

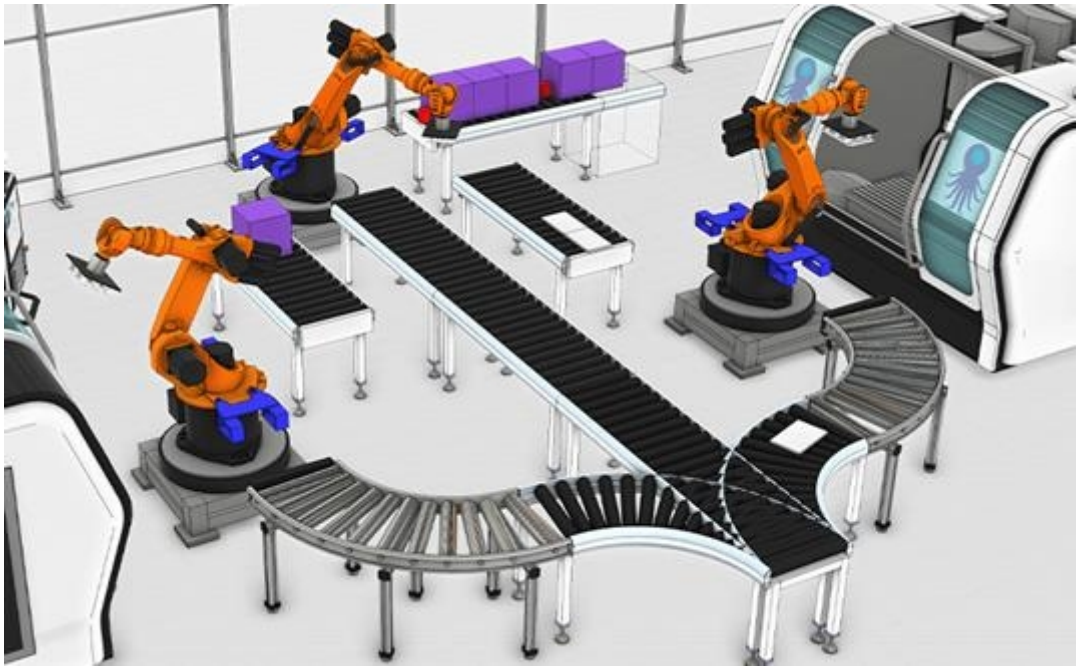


Figure 4: Octopuz OLRP - multiple robots and even CNC machines can be handled in the simulation. The software helps you calculate cycle time and other useful production statistics.

Some software, such as Artiminds and Drag & Bot, support force-feedback and vision-feedback programming, which is particularly useful for grinding and polishing activities, while others, such as

RoboDK (Figure 5), offer several APIs and plugins to be able to operate with a variety of CAD/CAM software, which is valuable in complex machining activities, such as milling.

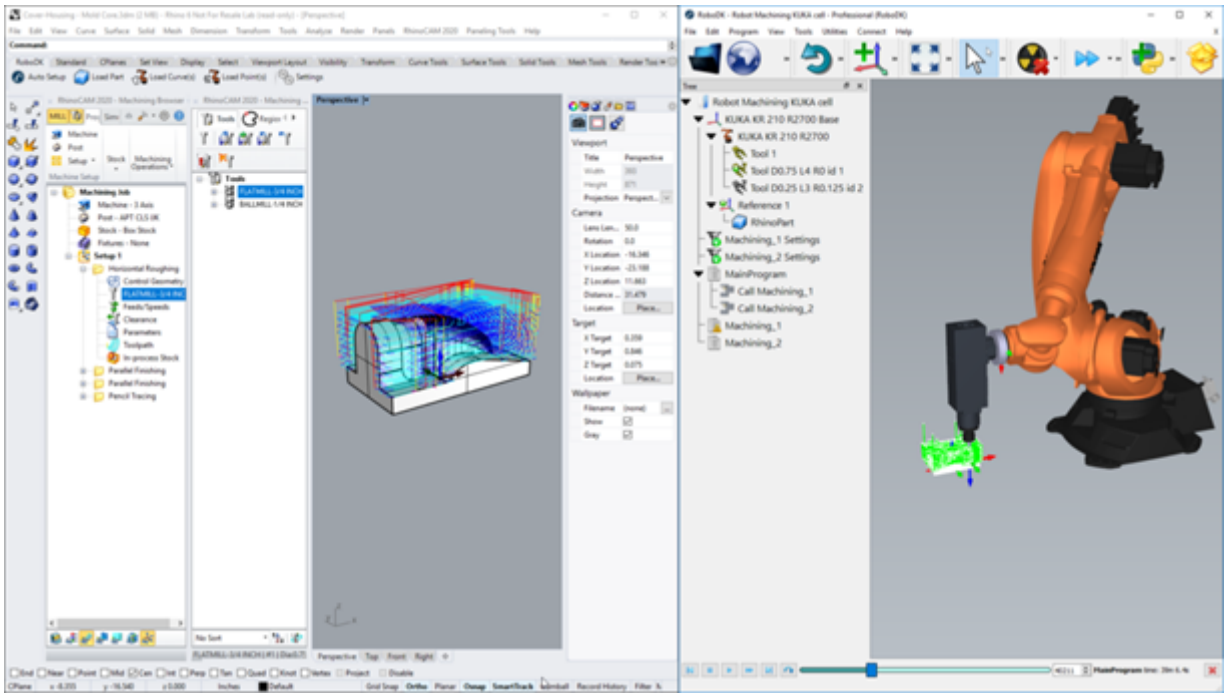


Figure 5: RoboDK milling application with Rhino CAM plug-in

OLRP meets COBOFIN

At Sirris we have extensive expertise on robots and robotic programming, and for the COBOFIN project (sand and debur with cobots), we will further look in to specific OLRP software capable of handling force feedback input.

Want to know more? Contact our experts and learn how we can help you in your OLRP selection and adoption!

Sources and OLRP website

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